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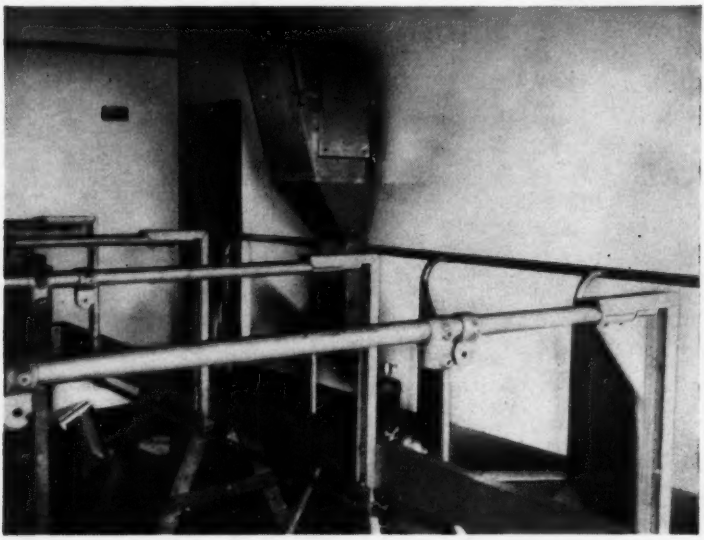

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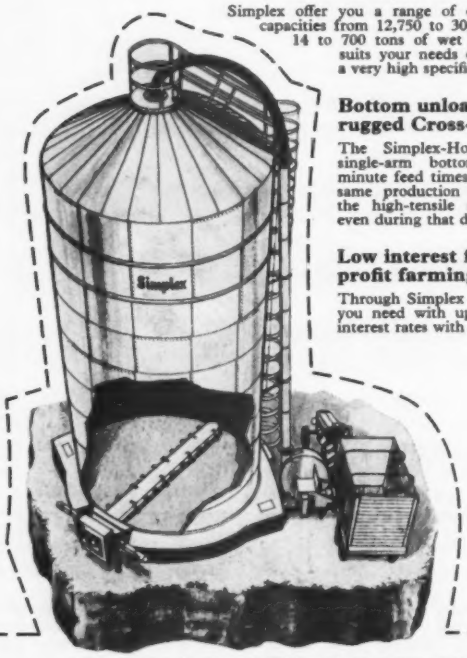

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Plate 1 Wind pruning effect on west side of hedge

A review of eighteen years experience on an exposed site in south-west England of planting

Shelter Belts and Hedges

H. J. Eaton, *Director, Rosewarne E.H.S.*

WHEN Rosewarne Experimental Horticulture Station was established in 1952 on an exposed site near Camborne, in West Cornwall, shelter had to be provided. This was necessary so that experiments could be undertaken with winter and spring crops, particularly anemones, narcissus and early potatoes, and advantage was taken of this need to try out a large number of different types of hedgeplants and shelter belt trees.* It is now possible to assess the overall effects of the shelter planting and to suggest ways in which the greatest advantage can be obtained for the smallest outlay.

The Station is situated on a flat ridge running E.S.E. to W.N.W. rising to 250 ft above mean sea level at the highest point and falling to 150 ft in the valleys on either side. The surrounding land is of similar conformation. Soil is the brown earth type, a medium loam with high stone content and a minimum depth of about 18 inches. The North Cornwall coast is about two miles distant, and severe, often salt-laden gales are likely to occur throughout the

*A summary of performance was published in Rosewarne E.H.S. Station Leaflet No. 2. Second Edition. 1970.

year. All the native trees and shrubs in hedges in the area show marked wind-pruning effects on the western side (Plate 1).

Station plantings

There are two main shelter belts. One running east to west along the southern boundary of the flat top of the ridge for the whole length of the property; the other, a parallel planting along the northern side, extends for about two-thirds of the total length. Two more main shelter belts cross north to south dividing the Station into three sections, each about 700 ft (east-west) and 400 ft (north-south).

The belts are composed mainly of three rows of *Pinus radiata*, a species that grows particularly well in the South West but is doubtfully hardy in the Midlands and the North. The original planting was made in the spring of 1953 and their average height was 13 ft 6 inches in 1963 and 26 ft in 1969. Other parts of the shelter belts are of single or double rows of *X Cupressocyparis leylandii*, sometimes interplanted with escallonias, planted in 1955; they were 14 ft high by 1963 and 18 ft by 1969. The cypress is more severely affected by salt-burn on the exposed side than is the pine. The remainder of the belts consist of trial plantings of numerous species of evergreen and deciduous trees.

On the southern slopes of the Station, hedges were planted 70 ft apart both of plants on trial and of strong growing varieties of escallonia and bamboo.

Effect on Station conditions

Measurements of wind velocity have shown higher speeds on the top of the ridge than in the valleys on either side. Other measurements made between well-established trimmed hedges when the wind direction was parallel to the hedges recorded higher speeds along the centre of the sheltered site than on unsheltered land nearby. Observations here and elsewhere have shown that the direction of the surface wind can be altered by valleys, shelter belts, hedges or any other obstruction of considerable length. When the wind is blowing at a narrow angle to these obstructions it will tend to straighten and blow along parallel to the obstruction, often with some increase in speed. Gaps in shelter belts and hedges, or between buildings, leads to funnelling of the wind and a marked increase in speed which can lead to severe crop damage.

Although the prevailing wind on the Station is south-westerly, gales have been recorded from all directions, east and north-east being the least common but amongst the most damaging. Often they are dry and salt-laden, leading to severe salt-burn.

To fully appreciate the difference the hedges and shelter belts have made to the site, it is necessary to visit the Station under gale conditions. Plates 1 and 2, which show the same Cornish hedge in 1952 and 1970 (just visible behind the pines) give some indication of the change in the micro climate over the Station. The annual wind run, measured at 6 ft on the agro-met station 200 ft east of the main north to south belt, has been about one-quarter less over the past three years than its previous average.

Soil temperatures recorded in the sheltered areas are on average up to 1·7°C higher than in more exposed sites, although this increase is more marked in the spring and summer than during the winter.

Siting shelter belts and hedges

The areas effectively sheltered by hedges or shelter belts are generally agreed to be about 10–15 times the height of the barrier when the wind is blowing at approximately right angles to it; all benefit is lost at a distance of 30 times the height. The most effective barriers at Rosewarne are so sited that their height effect is enhanced by the slope of the land they shelter or because they are at right angles to the valleys running along the north and south sides of the Station. The surface wind direction tends to be deflected by the valleys to be at right angles to th shelter belts.

The east to west shelter belts along the edges of the top of the ridge have the maximum effect, depending upon the wind direction on the land sloping away to north and south; on the more level land at the top they afford only average cover. The most difficult sites to shelter are slopes facing into the prevailing wind that are not sheltered by adjacent land. Here, the effective height is greatly reduced and on southerly slopes shading can be detrimental to cropping.

Trimmed hedges are very effective for the close sheltering of crops, particularly where very limited areas of land are available. They are expensive to establish and maintain and the area sheltered by each hedge is relatively small. For high value crops in situations such as the Isles of Scilly, where winter and early spring flower growing would be impossible without hedges on all sides of each small field, they are essential. Long parallel hedges spaced 10 or 15 times their height apart are effective when well sited but they need to have temporary shelter screens spaced in the same way at right angles to them to protect very susceptible crops from the funnelling effect of wind blowing parallel to the line of the hedge. The cost of establishing and maintaining trimmed hedges would not normally be justified on a commercial

Plate 2 Pines showing signs of thinning at base after 17–18 years

holding except for high value crops. Generally it is more economic to seek naturally sheltered land than to build up a whole series of shelter hedges.

Shelter belts are normally of one to three rows of trees planted, where possible, at 5 ft to 6 ft between centres and rows. Outer belts should preferably be of two or three rows and inner belts, to keep the ground required to a minimum, of one or two rows.

Belts composed wholly of trees tend to thin out at the base relatively quickly; the pines in Plate 2 are showing signs of thinning 17 to 18 years after planting. Almost all trees eventually suppress the growth of their own lower branches owing to shading. Some of our most effective shelter belts are a combination of tree and shrub planting; one or more rows of trees with a hedge of strong-growing escallonia on the windward side. These have developed into dense hedges of about 9 to 10 ft in height, trimmed only on the outside with a further 10 ft of tree growth above (Plate 3). Eventually the trees should reach at least 30 ft and the shrub growth should ensure that the belts retain a well-filled base.

Plate 3 Tree and shrub planting

Selecting shelter plants

As an aid to the selection of suitable shelter plants the leaflet mentioned on page 185, should be consulted and local advice obtained. Economical trees to plant include any pine that thrives on exposed sites in the area, particularly those like *Pinus contorta* or *P. nigricans* which can be easily transplanted from nursery beds (unlike *P. radiata* which has to be planted out at less than one year old from paper pots because it will not transplant satisfactorily when grown in nursery rows and lifted in the usual way). Useful shrubs to form the outer row on the windward side include privet, although it tends to be deciduous in exposed coastal areas. Near the coast, large-leafed *Escallonia macrantha* hybrids such as Red Hedger or Crimson Spire are outstanding. They would probably have to be propagated from hardwood cuttings on the holding and planted in April direct from the cutting bed, as they are normally grown in containers and the cost would be too great for large scale planting.

The most salt resistant shrubs for use near the sea are the silver-leafed *Elaegnus—E. x Ebbingei, E. macrophylla* and *E. glabrai;* the last is more straggling in growth and well adapted for planting to 'fill in' existing windbreaks. Home propagation would probably be necessary to obtain large numbers of plants as supplies are limited and relatively expensive. The slow growing *Pinus mugo* could be used for the outer row but growth of some clones is slower than that of the other shrubs mentioned above.

Establishing shelter belts

All shelter planting is an attempt to grow trees and shrubs on sites where conditions are the worst possible for satisfactory establishment and growth. The cost is considerable and unless every care is taken to obtain good results the investment will yield a very poor return. Weed competition must be controlled until it no longer provides a threat to growth; perennial weeds should be cleared from the site before planting. Fairly small planting material should be used so as to encourage maximum root development before the tops are likely to be too seriously affected by the wind. The more exposed the site, the wider the belt required. At least three or four rows will be required to gain height reasonably quickly, as the outer row is often severely dwarfed by wind pruning. A single row of a strong growing shrub could be substituted for the two outer rows of trees; it would have a greater spread in the early growth and provide better protection to the inner rows. A reasonable phosphate level in the soil probably aids establishment, but little response to fertilizer has been noted in our trials.

Early spring planting to allow a full summer's growth before severe winter gales are experienced is generally best in the wetter areas of the country. Late planting can be damaged by spring droughts and early autumn planting is probably preferable in drier areas.

Planting should be within the shelter of an existing hedge or bank wherever possible, or temporary artificial shelter provided in very exposed positions. Young plants are most vulnerable to damage or killing by wind rocking in the first few years. If necessary, they should be securely staked at planting and the top growth trimmed back whenever necessary to reduce wind rocking.

Newly planted shelter belts should be examined after each gale and any loosened plants staked or re-tied and re-firmed. Top growth should be shortened back, if required, to reduce wind pressure on the plant and enable it to re-establish.

A stitch in time

The provision of shelter is expensive. It is even more costly to embark upon a planting programme and then not take all reasonable precautions to secure satisfactory establishment of the plants and the fastest possible rate of growth in their early years. There is an increasing interest in hedges and shelter belts for their amenity value in helping to screen road and industrial development, suppress noise, and provide shelter and privacy for buildings.

This article has been contributed by **H. J. Eaton, N.D.H.,** who is the Director of Rosewarne Experimental Horticulture Station at Cornwall.

Ladder and Stairway Sense

Every year hundreds of farmers and farm workers are injured by falls. It is true that many suffer only relatively minor injuries, but others are seriously handicapped for life, and a number are killed. A study of accident reports clearly shows that certain elementary precautions can prevent most of these accidents.

Many such falls are caused by faulty ladders or by their incorrect use. Whenever a portable ladder has to be used, do make sure it is sound, long enough for the job, and that it is securely placed in position. If necessary, arrange for a second person to stand at the bottom to steady the ladder and prevent it from slipping. Many accidents are caused by the ladder suddenly slipping away; when this happens the person on the ladder has little chance of avoiding a serious accident. Never overreach, for this is one of the surest ways of causing a ladder to slip sideways. It is sensible, and far safer, to climb down and move the ladder, even though it will take a little longer to complete the job. Make it a rule always to keep both feet firmly on the rung.

Badly worn, ill-lit, or cluttered stairways can be treacherous. Make sure that all stairways are sound and that there are no obstructions such as sacks or pieces of equipment left lying about on the steps to cause someone to stumble and fall. Worn, greasy or ice covered steps can cause nasty accidents. These can be avoided if a careful check is made of them before they are used. A supply of sand, and salt in the winter, should be kept readily available to grit and thaw out these potential hazards.

When roofs and gutters require attention, make sure you have the right equipment available and that it is used correctly. Remember that roofs are not designed for people to walk on, so always use roof ladders and crawling boards. An additional precaution is to use a secure lifeline which should be long enough to permit freedom of action but short enough to prevent you falling from the roof. Fragile roofs, such as those made of asbestos-cement sheets, are brittle and dangerous to step on. A permanent warning notice should always be displayed on buildings with this type of roof.

★ ★ ★

What is B.F.P.C.?

The initials stand for British Farm Produce Council and all of the money it needs to do its job comes from farmers and growers.

So what does it do? Briefly, it tells consumers more about the quality, availability and use of all the foodstuffs produced by Britain's farmers and growers. It does not interest itself in pushing brand names or sectional interests, nor does it indulge in the politics of the agricultural industry.

It came into being to help the housewife and to help the producer to provide the goods she needs. So one of its primary functions is to regularly provide up-to-date basic information about the choice and treatment of home-produced foodstuffs. But this is but a very brief summary of the work of the Council; to find out more you should write to B.F.P.C., Agriculture House, Knightsbridge, London S.W.1.

The Tick Problem at Redesdale

J. R. Thompson, *Director,*
Redesdale E.H.F.

THE pasture tick, or sheep tick as it is more commonly known, is found in varying degrees throughout practically all the hill and upland areas of Britain. The degree of infestation and the losses of stock involved depend upon many factors and the incidence of attack varies from farm to farm and from season to season. It is present on most of Redesdale Experimental Husbandry Farm, where it causes management problems in carrying out critical experimental work and makes it difficult to introduce unacclimatized stock. Its presence, however, does make us aware of the difficulties encountered when ticks are present and enables us, in conjunction with the Veterinary Investigation Centre, to do some work on its possible control and eradication.

Before discussing what is being done at Redesdale, it is appropriate to outline the tick's life history and the losses which it may cause. The necessity for and possibilities of control will then be more apparent.

Life history

The sheep tick has a life cycle of three years and during this period it spends approximately only three weeks as a parasite on the host. While it is commonly found on sheep it has many alternative hosts and can readily feed on other animals such as cattle, deer, dogs, birds and small rodents. When not feeding on the host it continues to develop on the surface of the ground where a high moisture content is essential for survival. It is, therefore, most prevalent where there is an abundance of rank, under-grazed vegetation.

The eggs are laid in decaying vegetation on the ground and larvae emerging from them become active the following year. The larvae attach themselves on a suitable host, usually sheep, and engorge on blood. After feeding for three or four days, the larvae fall to the ground and remain there until the next year while developing to the nymph stage. They again attach themselves to a suitable host for a feeding period of from four to six days before dropping to the ground to spend a further twelve months developing into the adult stage.

The adult females (males do not feed) attach themselves to a host and it is during this final feeding stage of up to ten days that mating takes place. After

completing feeding, the female drops to the ground where she lays her eggs and the life cycle starts again.

When ticks are feeding on sheep the majority are found on the bare parts, with the greatest proportion on the ears, head and axillae; all stages of development may be found simultaneously on the host.

Disease carriers

It is as carriers of disease that ticks are important; they are responsible for the transmission of louping ill, tick-borne fever and tick pyaemia in sheep. All three diseases are present at Redesdale but louping ill is not very prevalent and even when there was a vaccine available it was not considered serious enough to justify vaccination. Each year the farm loses one or two young sheep through the disease and in 1970 had to dispose of a twelve-month heifer stirk which was affected.

Tick pyaemia causes some losses of lambs each year, some of these having the typical abcesses in the joints; in others the abcesses were only found internally on post-mortem examination.

Female ticks feeding on ear of calf

Unfed nymphs

Engorged nymphs

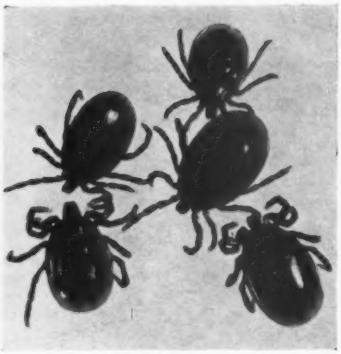
Tick borne fever is also present but does present any management problems amongst the acclimatized stock. It was suspected to have caused temporary infertility in a young bull which was purchased, but this was not confirmed. The presence of this disease on the farm affects management because if unacclimatized pregnant animals are brought on to the farm and become infected they usually abort. In the autumn of 1969, eighty-five Swaledale ewes from a tick free farm were bought and came to Redesdale in November when the normal tick season is over. They were all dipped against tick in the autumn and again in spring. The majority lambed normally but some of the last ewes to lamb dropped their lambs before full term. It was suspected that this may have been a result of tick-borne fever.

Control

It is during the short feeding periods on the host animal that the tick may cause damage by spreading diseases. When it is realized that during the 3-year life cycle only about three weeks are spent attached to the host, the difficulties of control can be appreciated. Control measures at Redesdale have been typical of those practised in the locality and have been aimed at controlling the problem rather than eradicating it.

Immediately before lambing, which commences in mid-April, all sheep on the farm are dipped. During the dipping very few ticks have been seen on the sheep, but it is expected that the effects would last enough to kill any tick which might attach itself during the next few weeks, so helping to reduce tick numbers.

In 1967 and 1968 the intention was to 'half-dip' the lambs at three to four weeks of age. Unfortunately, due to adverse weather conditions, it was not possible to dip all the lambs and many of them were carrying a high population of tick when they were dipped later in the summer. Considerable trouble from tick pyaemia was then experienced. There are, of course, serious practical difficulties of 'mothering-up' after dipping lambs; this means that only small numbers can be handled at a time—not a very practical proposition when large numbers of sheep from an open fell are involved.



Unfed adults

Engorged adult females

In 1969–70 it was decided to use an anti-tick cream instead of dipping. The main places where the tick attaches itself to lambs is on the bare parts in the armpits, the groin, and on the face and ears, and these are smeared with cream. On those parts of the farm where tick are particularly prevalent, the application is repeated after three to four weeks. When treated lambs have been examined later, only dead ticks have been found on them. No critical work has, however, yet been attempted at Redesdale on this form of control.

Following work which G. B. S. Heath carried out in Cumberland (in which the tick was eradicated from a twelve acre enclosure by regular, controlled dipping) an area of land on Redesdale E.H.F. has been fenced off. At present, this cut carries 180 breeding ewes of regular ages and, in conjunction with the Veterinary Investigation Centre, it is proposed to see if tick can be successfully eradicated from the area.

Land improvement

For the greater part of its life the tick's survival depends on it finding a suitable habitat. This must be moist and provide shade and cover. These conditions are to be found on most undergrazed hills, especially when sheep are the only grazing animal. Where land can be economically improved it not only provides better grazing for stock but may also reduce the tick problem by removing the suitable habitat.

At Redesdale, the hill areas are now fenced into manageable units to permit experimental work. Land improvement by various methods is taking place, including open drainage, the application of lime and basic slag, and heavy initial stocking with cattle to remove rank vegetation.

Mechanical methods of defoliation using a forage harvester have also been used. All these treatments aim at improving the sward for the grazing animal, but at the same time produce conditions which are unsuitable for the tick.

There are, however, large areas of the farm where the sward cannot be altered but it is hoped that land improvement, together with regular spring dipping and treatment of the lambs, will bring the tick problem and its attendant diseases under control.

The author discusses in this article the economic and performance aspects of various poultry house ventilating systems.

Modern Poultry Environment

P. G. Spencer

THE last decade has seen a series of unprecedented changes in the poultry industry which are unlikely to occur again. The soaring costs of land and labour have forced stocking densities to previously unconsidered limits. The expected reduction in individual bird productivity as a result of this trend has not materialised because more efficient production of eggs and meat from food has been essential to combat rising food prices. The vast change in the cost structure of the industry has demanded the introduction of a new technology, part of which is controlled environment.

In the above context, environmental control may be defined as the selection and operation of poultry production systems to allow the most efficient transformation of basic (plant) foodstuffs into human foods at various combinations of capital resources. This is a much wider than normal definition, because what is thought of generally as environment is actually only that part which should more correctly be called climate.

It is perhaps the confusion between these terms which gives some indication of the importance of the climate in environmental control. The good stockman has always practised climate control, even though he was probably the one who least realized why his actions produced results.

However, with the coming of the 'agribusinessman' more knowledge was needed than the stockman's 'feel' for a situation. So, today, a multitude of poultry houses are marketed by a number of companies and the label 'controlled environment' is attached to them. The poultry producer is asked to believe that a building will give him the climate control he requires, and to spend thousands of pounds in support of that belief. But he has no objective assessment of what the building can achieve.

Types of ventilation

In spite of the vast number of designs, poultry housing falls into six basic categories when classified by combination of air inlets, outlets, and distribution systems used by each:

Natural ventilation: the original method of ventilation for poultry is characterized by the lack of fans. To bring fresh air to the fowls the system uses wind and convection currents.

Conventional ventilation: a direct progression from natural ventilation differing only by the incorporation of a fan into the system.

Floor to roof ventilation: a similar system to those described above, but in this case the house is raised on stilts with the air inlets positioned in the floor.

Reverse flow system: air is brought in at the ridge and distributed over adjustable shutters before being extracted at or below bird height through the side walls.

Ducted reverse flow system: this is essentially similar to the reverse flow system, the only differences being that a duct is used to distribute the air, and the use of a duct makes it possible to place the fans in the more preferred position in the gable end. The house can, therefore, be put under positive pressure, although extractor fans are often incorporated in the system instead.

End to end or cross ventilation: air enters at one end or side of the house and is extracted at the other.

Operating standards

However, even after reducing the apparent choice to manageable proportions, any comparison between systems would be useless without defined criteria. They must necessarily be subjective to some degree, but at least seven key attributes should be considered:

1. The ability of the ventilation system to remove waste airborne products, heat, carbon dioxide, water, ammonia, dust and micro-organisms. Since heat is the most limiting factor in temperate climates the criterion here is easy to establish. Generally speaking, the ventilation system should be capable of preventing the house temperature from rising more than 3°C above the outside temperature when the house is fully stocked. Failure to meet this requirement has resulted in loss of body weight in broilers during hot summers, and may be a cause of seasonal fluctuation in egg quality.
2. The ability of the ventilation system to maintain house temperature in cold and windy conditions. The criterion here will depend on the feeding regime practised. Fowls given restricted feeding programmes probably cannot justify a house temperature of much more than 10°C. However, *ad lib.* fed birds perform far more efficiently at temperatures over 18°C. Hence the majority of poultry houses should be capable of maintaining at least that temperature under the cold extremes of the British climate. Where stocking densities are lower than one bird per square foot and house insulation level is less than 2 in. of glass fibre ($U=0{\cdot}15$), supplementary heat may be necessary.
3. The effectiveness of the air distribution system. Temperature distribution in the house is the most acceptable means of checking air distribution. Since temperature variations of more than 3°C are likely to have a significant effect on food intake and efficiency of food conversion, an efficient air distribution system must maintain the temperature at any point where there are birds to within 1·5°C of the desired average house temperature.
4. The ability of the system to prevent overheating in the event of a power failure. This requirement is, however, simple to meet when designing the system, e.g., by the installation of alarms and power-generators. Here the basic system, without the incorporation of secondary power sources, is considered.

5. The ability of the house to maintain the desired lighting patterns. Essentially birds require between 1 and 5 foot candles during their 'daylight' hours, while 'dark' periods should be below 0·04 ft c. The poultry house should ideally be capable of achieving these levels independently of outside light intensity.
6. The simplicity of and time required to operate the climate control machinery. With increasing wages, the simpler the controls and the less the time needed to operate them the better, provided that capital costs do not become excessive.
7. The overall capital cost of the building including both initial and working capital requirements. Obviously this should be as low as is economically feasible.

The table shows the degree to which each of the six ventilation systems meets the requirements of the seven key attributes. Particular house manufacturers may have adopted certain designs which lift their building above average in one or two respects but any differences are usually small, so that the table will be a reasonable guide in most cases.

Attribute	*Natural*	*Conventional*	*Floor to roof*	*Reverse flow*	*Ducted reverse flow*	*End to end*
1	poor	good	good	mod.	mod.	mod.
2	poor	poor	poor	mod.	good	good
3	poor	poor	poor	poor	good	mod.
4	good	good	good	mod.	poor	poor
5	poor	mod.	mod.	mod.	good	good
6	high	high	mod.	high	low	low
7	low	mod.	mod.	high	high	mod.

It cannot be denied that any ventilation system can produce the required result. However, the table does indicate which systems are likely to give the results with the lowest labour demand. Thus 'ducted reverse flow' and 'end to end' ventilation systems, once set, make little further demand on labour, whereas natural, conventional and reverse flow systems require almost daily attention by experienced personnel if physical performance is not to suffer markedly.

The art of climate control, therefore, has two extremes. On the one hand the agribusinessman requires a poultry unit which will perform in a predicted way without expensive skilled labour. On the other hand the stockman desires a building which he can control to provide the climate of his choice. For this reason there is no theoretical argument as to which is the better system, since the choice is a matter of personal circumstance, affluence and inclination. Nevertheless, as profit margin per bird continues to decrease, many stockmen are beginning to realise that they are better off buying a ventilation system that will look after itself, so that they themselves can tend more stock.

The author, **P. G. Spencer, B.Sc.(Hons.)**, is a specialist in the environmental housing of poultry and is stationed at the Ministry's Regional Office in Leeds.

Shooting Accidents on the Farm

Gun accidents continue to occur regularly on farms. Last year was a particularly bad one for this type of accident and already three people have been killed this year.

Many of these accidents happen when farmers or farm workers are shooting at rabbits, wood pigeons, crows, etc., when out working on the land. Children, too, are often the victims of careless handling of shotguns. A boy of thirteen has been killed this year, and last year a ten-year-old boy was killed when he was accidentally shot by his older brother.

Several deaths have resulted from loaded shotguns being carried on tractors. This practice is not only foolhardy but extremely dangerous. Whenever a shotgun has to be carried on a tractor, combine, or any other vehicle, it is vital that it is unloaded.

Before climbing over or through obstacles the cartridges should always be removed from a gun. It is no good relying solely on the effectiveness of the safety catch. Accident reports clearly show that to attempt to cross a fence or a hedge with a loaded gun is asking for trouble. Only recently a farmer was killed when his gun went off as he was getting through a gap in a hedge.

Contrary to what many people believe, it is not sufficient to open the gun and leave the cartridges in; neither is it safe, with some old hammer guns, to let the hammers down. A gun with a faulty firing mechanism may go off if it is dropped, and a hammer can catch on twigs, branches or nails and be pulled back sufficiently for it to strike and fire the cartridge. Some hammerless guns have been known to go off even when the safety catch was on because of a fault in the internal mechanism that the user knew nothing about.

Anyone aiming a gun should make absolutely certain that he can see where he is intending to shoot and that no one is in the line of fire. No one should ever shoot blindly into a hedge, a wood, or anywhere where other people might be.

A gun should always be treated as if it was loaded. It should be well maintained and kept in a safe condition. If there are any doubts at all about this, it should be overhauled by a competent gunsmith and proof-tested.

It should be remembered that a ·410 shotgun is just as lethal as a 12-bore; it has practically the same pressures and velocities. Although there are less than half the number of pellets in a ·410 cartridge, any one of these can kill. It is not a learner's weapon just because it is smaller and lighter.

Children are naturally inquisitive and seem to have an inherent interest in guns; so a loaded gun should never be stood in a corner of the kitchen or indeed in any room to which children have access. It is wisest to make a habit of putting guns and cartridges in a safe place immediately after use, preferably somewhere that can be locked up.

If these simple, commonsense rules are followed, farmers and farm workers will not only be able to enjoy their sport but they will be helping to

Keep Farming Safe.

★ ★ ★

New tests are being developed to provide additional information on potential seed emergence; but in determining the farmer's choice of seed one essential is still

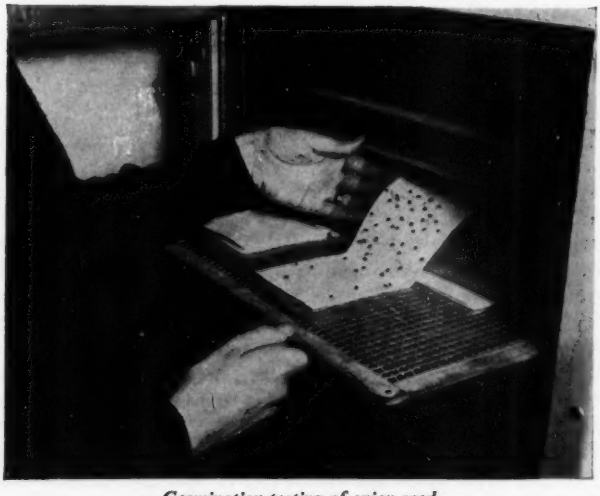
Germination Testing

Lynn V. Bedford

IN the middle of the last century a survey of commercial seed was carried out in Germany. It covered stocks sold by the larger seed houses in the country and revealed that the average germination of their seed was only 18 per cent.

Laboratory tests

Concerned at this state of affairs, Professor Nobbe, in Saxony, began work which was to form the basis for germination testing throughout the world. At his station in Tharandt tests were carried out on an advisory basis; seeds were germinated in a number of different artificial media, including clay dishes, blotting paper, sawdust and sand. At first, viability was judged solely on the emergence of the radicle (the part of the plant embryo that develops into primary root), so that any seed which sprouted was included in the percentage germination.



Germination testing of onion seed

The Royal Agricultural Society of England provided a similar service for its members in this country and there is no doubt that by its campaigning for better quality it did much to raise the standards of seed sold in England. In 1908 the Society's botanist gave evidence in a court case when a member, on returning to his merchant a sample of red clover of 21 per cent germination, was sued for payment. Not surprisingly the judge decided that the seed should be returned and no payment exacted.

It was not until the first world war, however, that legislation was introduced which made seed testing compulsory. Since that time a declaration of percentage germination has been required on nearly all agricultural and horticultural seed offered for sale. Consequently, it has been necessary for testing methods to be standardized to enable results to be closely reproduced. These aims are most easily achieved when tests are carried out under conditions ideal for the particular species. Should any declaration be questioned the result can be checked by means of a repeat test.

Emergence of the radicle in a germination test is not a satisfactory guide to the ability of the seed to produce a seedling in the field; for instance, plants without a fully developed root system would be hampered in the uptake of water and nutrients from the soil. Therefore the test is now prolonged until the essential structures of the seedling can be readily seen. Any seedlings which show some serious defect are discarded; there are now internationally accepted definitions of 'normal' and 'abnormal' seedlings. The 'germination percentage' recorded at the end of a test represents the number of seeds which have produced normal seedlings under optimal conditions.

Field emergence

It is on the basis of a germination test that the merchant offers his seed for sale. But what guarantee has the buyer that the germination figure will be reproduced in the field? In fact precise reproduction is most unlikely. Both soil types and local weather conditions vary. Field conditions are rarely perfect, so that usually fewer seedlings emerge than in the laboratory. But so long as these facts are recognized the germination percentage can still be a valuable guide to the grower.

Calculations of seed rates based on the germination figure include a 'field factor' varying with local conditions and time of sowing. In experiments with spring wheat we have found that field emergence levels fluctuate considerably from year to year, but the proportion of viable seeds which emerge at a single site in any one season remains the same for seed lots covering a wide range of germination levels. In our experiments at Cambridge in 1970, approximately 45 per cent of live seeds emerged from samples of both high and low germination. Our experience with onions, however, has been that lower germinating samples give relatively poorer field emergence than those with high laboratory germination. We might find that from a sample with laboratory germination of 90 per cent, 81 per cent of viable seeds emerged, while for a sample with 70 per cent germination only 60 per cent of live seeds emerged. For such crops it is particularly important to sow seed of high laboratory germination.

While the majority of samples will follow one or other of these patterns there are certain cases where individual lots of seed give unaccountably low emergence in the field. These lots possess some weakness which does not

Electro-conductivity testing of pea seed

manifest itself under ideal conditions but which renders the seed susceptible to poor growing conditions. Investigations at the Official Seed Testing Station aim at explaining the reasons for these failures and at finding tests which can detect the weak samples.

Peas and conductivity

The pea crop is one in which failure has long been recognized. Some samples, even though of high germination, give poor field emergence, particularly when sown early. As long ago as 1924, work on this problem was in progress at the seed testing station. However, it is only in the last decade that a test has been developed by which we can detect poor quality samples of peas before they are sown.

We know now that pea seeds exude sugars and other substances when they are soaked in water, and that this also happens when seeds are sown in wet soil. Experiments have shown that the growth of some pathogens (chiefly *Pythium* spp.) is stimulated by the presence of those substances and that the seeds are then attacked. Peas are more susceptible to attack in cold wet conditions, when their germination and early growth is retarded but when fungal activity is encouraged; hence the common observation that failure most often takes place after early sowing. Chemical seed dressings are of some assistance but do not prevent dramatic losses from some seed lots.

It was found that peas differed in the amount of substance they exuded, and from this it was only a short step to the realization that samples with higher exudation were more likely to succumb to fungal attack. The reason for the exudation is not fully understood, but it seems to be associated with a

deterioration of the cell structure leading to increased permeability and consequent loss of soluble products. Workers at the University College of North Wales and at O.S.T.S. collaborated in a series of experiments to find a quick and easy test for measuring substances dissolved in the steep water. The one adopted, known as the electroconductivity test, measures the amount of dissolved substances in a solution by recording its ability to conduct electricity. A high reading indicates the presence of large amounts of substances dissolved in the water and is a warning of possible crop failure. A number of years of plot and field experiment have enabled certain predictions to be made on the basis of test results and Fellows of the National Institute of Agricultural Botany have been helping us recently with observations on the emergence of their crops.

As a result of this work we are now able to divide seed lots into several categories. Those with low conductivity are of good quality, suitable for early sowing. Others, with higher conductivity, may not be suitable for early sowing but should give satisfactory emergence when sown later in the year. A smaller number of samples giving very high readings would not be suitable for sowing at any time. Differences in conductivity are not varietal but are associated with weaknesses in particular seed lots. While the test is now considered sufficiently reliable to be offered by the O.S.T.S. on a routine basis, further study will enable us to refine our classification and give greater accuracy to the interpretation of our results. A conductivity test does not replace the germination test but is an addition to it, and is normally applied only to high germinating samples.

Importance of testing

Of course peas are not the only crop in which seed weakness is to be found. With the increased use of precision drilling in vegetable growing, and the lower seed rates consequent upon this, the grower is becoming more aware of the shortcomings of certain lots of seed. When high seed rates were the general rule, failure of some seeds to germinate was not important; usually enough grew to produce a reasonable stand. Now each seed which fails to emerge is represented by a conspicuous gap in the row. The grower, quite rightly, demands seed of high quality and with the help of germination results and 1,000 seed weight, and on the basis of local experience, he is able to calculate seed rates in such a way as to attain his particular target stand.

We have seen that, with onions at least, live seeds are less likely to produce seedlings in the field when the samples from which they come are of low laboratory germination. If low germination is a symptom of seed weakness then it becomes even more important to sow seed of high germination. Supplementary tests may be developed which will enable us to pick out seed with specific weak points, but these are secondary considerations. In order to obtain good emergence the grower must first of all start with seed of good germination. Thus the modern germination test, with its detailed evaluation of individual seedlings, remains an essential step in crop production.

The author, **Miss L. V. Bedford, B.Sc.,** is on the staff of the Ministry's Official Seed Testing Station at the National Institute of Agricultural Botany, Cambridge, where she is investigating the relationship between laboratory germination and field emergence.

Farm Co-operation in Merionethshire

Barry Thomas

AREAS of hill farming such as Merionethshire are traditionally associated with mutual help of varying kinds. The threshing day and particularly the shearing day were not only times of communal help but also great social occasions. Many references to such days may be found in Welsh literature and poetry. A survey was undertaken to find out to what extent, if any, these practices are used today and also to see what inroads co-operation of a more formal nature has made into the area.

Merionethshire is a mountainous county with rivers running down narrow valleys to reach Cardigan Bay, the exception being the River Dee which runs east and flows into the sea below Chester. It is an area of great natural beauty, virtually the whole of the county being in the Snowdonia National Park, and is a popular touring area in the summer months.

A representative sample of farmers from a distinct geographical area in the county was chosen, and each was personally visited and interviewed to complete the questionnaire used in the survey.

Informal co-operation

Informal co-operation among farmers in an area such as that surveyed is still of considerable importance today. Of the farmers interviewed, less than ten per cent were not at present involved in mutual help. A total of seven activities were examined, and help given and received with these varied considerably.

Sheep shearing was the task in which informal co-operation was found to be most commonly practised. This is an operation requiring a large number of hands, especially when sheep from several farms are run together on an open mountain, as is to be expected in a hill farming area. To a lesser, but nevertheless important, extent sheep dipping was found to be communally undertaken. The least commonly practised kinds of informal co-operation were the lending or borrowing of machinery and the joint ownership of machinery; the latter is a comparatively recent development and no doubt accounts for the small number of examples found. Younger farmers were more involved in informal co-operation with machinery than older farmers, who preferred to adhere to the more traditional co-operative tasks.

Farmers tended to help non-relatives rather more than relatives, the ratio being 3:1; this was the case for all the activities examined. Assistance with hay harvesting and by the lending or borrowing of machinery was found to be more common among boundary neighbours than among others; which is to be expected. Neither age of farmer nor farm size were found to influence informal co-operation to any great extent.

In former days the social aspect of informal co-operative activities was of considerable importance; it was a time honoured ritual to stay for supper after the day's work was done and conversation would usually continue until after midnight. Today this aspect of co-operation has diminished greatly,

mainly because farmers are generally the sole source of labour on their own farms and cannot, therefore, spare the time.

Formal co-operation

Agricultural co-operation of a more formal type has been a part of Welsh agriculture since the beginning of this century after earlier unsuccessful attempts. The first agricultural co-operative society in Merionethshire was founded in the 1920s.

At the present time the county is well served with co-operatives of the kind well suited to the farming of the area. These include marketing and selling groups, requisite and general purpose societies, and other bodies such as the Agricultural Central Trading Ltd. Fox destruction societies are included, as these provide a specific service and are run on co-operative lines.

Societies for buying and selling

Societies formed for the purchase of farm requirements, such as food and fertilizers, are by far the most popular with farmers. With these there is no strict discipline and member-farmers have no specific obligation to buy their needs through the society although most of them obviously do so; in this type of society non-members may also use the purchasing facilities. Although there are several selling groups which draw members from the area, few farmers belong to them. With selling groups the discipline is very carefully controlled and if members offend they may be penalized or even asked to leave the group. Farmers tended to value their independence too highly to place too much reliance on such groups, although there were some exceptions. Many thought the selling was too remote from them when compared to an open mart.

Marketing arrangements

When asked about present marketing arrangements in the area, farmers generally expressed satisfaction, the vast majority preferring the open market as a means of selling their farm products. Markets are, of course, very important from the social standpoint and farmers are most reluctant even to consider not attending and selling at them. For many, market day is the only opportunity they have of getting away from their farms and this is particularly the case for farmers' wives. Farmers were also asked which type of selling they least liked and few, indeed, mentioned farmers' groups. However, this appears to be a negative attitude in that farmers generally have little or no experience of this method of selling.

The following Table shows the percentage of farmers who were members of each of the various types of formal co-operative societies:

Type of Society	*Percentage of Farmer Members*
General purpose societies	127·5*
Selling groups	5·8
Fox destruction societies	54·9
Others, e.g., A.C.T.	11·76

*Several are members of more than one society.

Farmers generally had little knowledge of what help and advice was available to them for co-operative ventures. The Welsh Agricultural Organisation Society has been active in the area for many years and farmers tended to be fairly familiar with its work. It is too soon for the work of the relatively new Central Council for Agricultural and Horticultural Co-operation in publicising the possible benefits of co-operation to have had much effect there yet.

Summary

Although of less importance than in the past, informal co-operation among farmers in the area of Merioneth studied still plays a significant role in the farming economy. Tasks such as fox destruction are tackled co-operatively and much reliance is placed on farmer-owned co-operatives for the purchasing of farm requirements. The selling of livestock through groups is of little importance at present.

Probably the greatest scope for development of co-operation in the area would be in the marketing of livestock. To do this successfully, production would need to be closely geared to demand. Present general purpose societies may be able to make a significant contribution to the dissemination of this type of co-operation by entering into the field of livestock marketing.

The author, **Barry W. Thomas, N.D.D.,** is an Assistant Dairy Husbandry Adviser with A.D.A.S. in Montgomeryshire.

Fireblight in Britain

Though apples escaped fireblight in 1970, pears did not. In most instances this was directly due to the failure of growers to inspect their orchards and nearby hawthorns at frequent intervals. In pear, two or three weeks between infection and the death of a tree has been recorded. This can also happen in young apples where the shoots arise directly from the trunk.

Rapid recognition of fireblight followed by rapid action will surely prevent the worst. Growers should look for dead or dying blossoms; for dead or wilting tips of young shoots and later for blackened foliage and dead branches. Although these signs could be due to common canker, they might herald fireblight. They should look also for similar signs on hawthorns. A coloured poster is available which will help in the recognition of fireblight. Copies of this poster can be obtained, free of charge, from local offices of the Ministry of Agriculture, Fisheries and Food or from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex, HA5 2DT. More detailed information is given in the illustrated Advisory Leaflet No. 571, which is obtainable, free, from the same sources. If in doubt, a grower should get in touch immediately with the nearest office of the Ministry's Agricultural Development and Advisory Service. The Advisory Leaflet outlines measures for the control of fireblight. These include instructions for the cutting out of diseased parts of fruit trees and for reducing the risk of spread.

Fireblight among ornamentals is mainly the worry of nurserymen and gardeners —but most farmers have gardens. The disease has been recorded in Britain in each of the following plant types: cotoneaster, hawthorn, mountain ash, pyracantha, whitebeam, stranvaesia. Its presence in any of these is a menace to other ornamentals and to nearby orchards and they should be inspected as rigorously as the fruit trees themselves.

Stop Tractors Overturning!

The overturning tractor is still the major cause of deaths on farms. Last year twenty-six people were killed in this type of accident. These accidents often happen in remote and relatively inaccessible places where help is not readily available to rescue the driver, who will nearly always be trapped in or under the tractor. Unless a safety cab is fitted, he may well be crushed to death by the weight of the machine.

Tractor accidents are often due to misuse, carelessness, inexperience or undue haste, and recognition of a few simple rules will go a long way to prevent them.

The first point to remember is to carry out regular maintenance and so ensure that brakes, steering and tyres are kept in good condition. The driver's life depends on their efficient functioning, with brakes in working order and evenly balanced, and tyres correctly and evenly inflated.

When working on hilly land, it is often safer to work up and down the slope rather than across it. If work has to be undertaken across a slope the wheels should be extended to their widest setting to give maximum lateral stability. A watch should be kept for hidden obstructions and depressions, such as boulders or shallow pits. The sudden lifting of a wheel, or causing it to drop, may result in the tractor overturning sideways with no warning at all. If possible, turning across a slope should be avoided, but if this is not possible the turn should be made slowly, keeping full control of the tractor.

When using a mounted implement on a steep slope it is safer to work down the slope and reverse back up it, rather than try to turn at the headlands. When towing another machine such as a trailer, baler or spreader, the correct gear should be selected before going up or down the hill. This will ensure that the driver is not caught out half way up the slope, a point where many outfits have run away out of control as he has tried to change gear. The trailer or machine will almost certainly jack-knife on the tractor causing it to overturn, often with fatal results.

Ground conditions frequently change according to the weather and the crop, so this is another thing to take into consideration. Wet, juicy herbage, short dry grass, and loose muddy surfaces, will not give good tyre adhesion and under these conditions it is best to choose a low gear and to drive with extreme caution. Any sudden application of brakes on such surfaces can cause skidding which may prove disastrous.

Overturning incidents are not confined to hilly land; many accidents occur on level ground. When ploughing or cultivating, work too close to the edges of ditches or ponds should be avoided. Many drivers have lost their lives when the ground has suddenly given way and the tractor has overturned into a ditch, drain or pond. So far as possible, undergrowth should be kept cut so that the driver has a clear sight of these and similar hazards.

When a tractor is used to grub out, or to pull out a bogged down vehicle, the chain or rope should be coupled to the drawbar hitch point provided. To hitch above this point will cause the tractor to be pulled over backwards. When pulling, the clutch should not be snatched, it should be let in slowly and evenly. If using a winch, the tractor should be set in line for the pull making sure the sprags are on firm ground and digging in easily.

Consolidating a silage clamp is another operation which often leads to accidents. If a tractor is used for this purpose the sides of the clamp should be examined to ensure they are properly supported and that guide rails are in position. When reversing up the slope care should be taken to keep the tractor away from the edges, which are liable to fall away without warning.

It is common sense that inexperienced people, especially children, should not be allowed to drive tractors. The modern tractor becomes ever larger and more powerful, and children are neither physically nor mentally mature enough to react correctly in a crisis. It is, in fact, illegal to allow a child under the age of 13 to ride on, or drive, agricultural tractors or any self-propelled machines.

Even if all these rules are followed, it is still possible for a tractor to be overturned if circumstances combine to create an unforeseen hazard, and there is no doubt that the best possible insurance is to fit a safety cab. All new agricultural tractors now have safety cabs fitted when sold, but why not fit one to your existing tractor? Many prudent farmers and contractors have already done so and it is a tribute to their foresight that we know of at least twenty-four drivers of tractors that have overturned who are alive today because their vehicles were fitted with safety cabs. A number of makes of approved cabs are available for the older tractors, so don't delay: fit one now and you will be playing a vital part in helping to *Keep Farming Safe.*

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Farm Safety Leaflets

The following is a selection of farm safety leaflets which may be obtained, free, from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex, HA5 2DT:

- Bulls
- Guns
- Take Care when you Spray
- Safe Handling of Cyanide Gassing Powders
- Safety with Circular Saws
- Tree Felling, Hauling and Scrubland Clearance
- Lifting and Carrying
- Electricity on the Farm
- Fire Prevention on Farms
- Tractors Overturning
- Dermatitis among Landworkers
- Prevention of Accidents

Mastitis Control

C. D. Wilson

In discussing mastitis the word 'control' is used rather than 'eradication' because it is recognized that it is not possible to remove all mastitis infection from dairy herds. Certain species of organism can be eradicated because they are limited in their habitat and are sensitive to the drugs used for treatment; but others are widespread in nature and re-infection occurs in udders that have been freed of infection by treatment.

Bovine mastitis, unlike tuberculosis and brucellosis, is not a public health hazard except in a few cases, and pasteurization of the milk destroys most of the organisms which might be a danger to the consumer. Because of this any mastitis control method must be economic—the cost must be less than the loss sustained as a result of the disease.

Losses

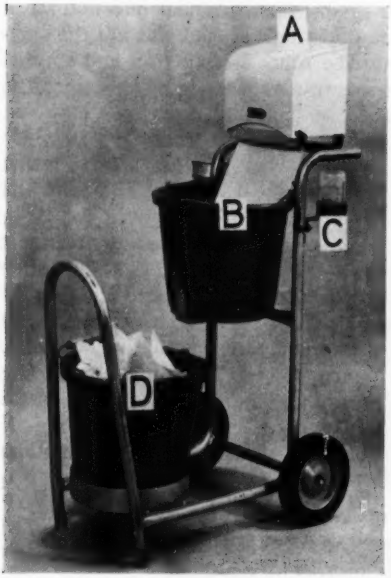
A herd with mastitis produces less milk and of a lower quality, and much of it has to be discarded while cows are being treated with antibiotics. Add to this the cost of drugs and professional advice and the total loss in a 100-cow herd can, at a conservative estimate, be more than £1,000 per annum.

Causes

Except in a very few instances, the direct cause of mastitis is always bacterial invasion of the udder, mostly through the teat ducts. When organisms invade the udder they usually produce a low-grade inflammation which does not show any obvious signs of disease. The milk is abnormal, however, with a high cell-count and there is a drop both in yield (20 per cent in each affected quarter) and in quality.

Only 40 per cent of infected udders ever show clinical signs of disease and most infections are not obvious to the cowman by examination of the strip-cup. While clinical mastitis can be associated with many species of bacteria, sub-clinical mastitis is usually due to infection with staphylococci or streptococci. These organisms are responsible for 95 per cent of the infection in sub-clinical mastitis and it is the control of this form of mastitis which is the subject of this article.

Bad management, a faulty milking-machine or poor milking techniques must influence the severity of a mastitis problem in a herd but they are secondary factors and cannot of themselves induce mastitis. They make it easier in various ways for infection to invade the udder, but even if corrected they will have little influence in reducing the level of an existing sub-clinical mastitis. The organisms must be eliminated from the udder and measures taken to prevent new infections occurring.



A hygiene trolley for cowshed use:
(*a*) paper towel dispenser,
(*b*) disinfectant in bucket,
(*c*) teat-dip cup and holder,
(*d*) used paper towels.

Prevention of infection

If it were possible to prevent all infections from entering the udder there would be no mastitis problem; but this cannot be done. The infection rate can be reduced, however, but at the moment only by adopting an adequate hygienic routine during milking.

Immunization by vaccination is not practical, nor is the breeding of animals resistant to mastitis, but numerous experiments have shown that infection can be prevented by milking cows in such a way that they are not exposed to contamination from the milkers' hands, the udder cloths or the teat-clusters. Infection of cows' udders is not a frequent occurrence and a cow becomes infected on average only once in every 300 milkings, but this still means that in a herd of 50 cows there will be at least 100 new infections each year. Since many infections last for a considerable time, even with a relatively low infection rate the level can reach a significant height in a lactation.

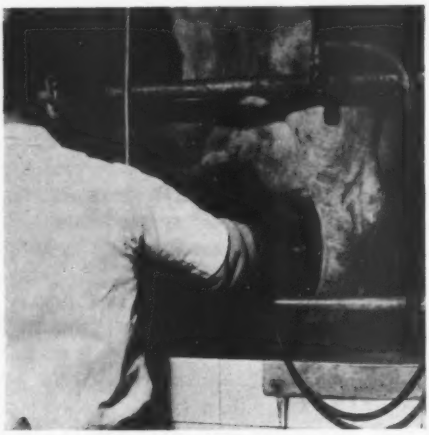
Experiments at the Central Veterinary Laboratory at Weybridge and at the National Institute for Research in Dairying have shown that under ideal conditions it is possible to prevent new infections almost entirely, but this is not possible in the field and the best that has been achieved so far is a reduction by half in the new infection rate. Because infections last for a long time, hygiene alone will operate very slowly as a means of mastitis control.

Elimination of infection

In the early days of antibiotics there was a considerable vogue in attempting to eradicate specific infections, particularly *Str. agalactiae*, from infected

herds. In most cases this was effective against this particular infection but it soon became clear that the eradication of a single species was not the complete answer to the mastitis problem. The other streptococci and staphylococci are either not so amenable to treatment or are more widespread in nature, and eradication by treatment was not considered practical.

A further limitation on the use of antibiotics was the contamination which occurred in the public milk-supply. Not only was this considered a health hazard but the presence of antibiotics in the milk interfered with cheese and yoghourt manufacture. Milk from cows treated with antibiotics has to be discarded; this has meant that more attention has been paid to the treatment of cows at drying-off to prevent summer mastitis and infection with other organisms and, particularly, to remove any infections present then in cows' udders. There are no problems of discarded milk with cows treated at drying-off, and it is known that there is a greater chance of successful elimination of infection in cows treated then than when they are in milk. This is probably associated with the longer time the antibiotic is present in the udder. One other point is that because *all* cows are treated at drying-off, there is no need to carry out the expensive bacteriological examinations necessary when cows are treated during lactation.



Washing udder under running water

It is possible to eliminate nearly 80 per cent of all infections present in a herd by treatment at drying-off with a suitable antibiotic formulation, but reliance on this alone would be only moderately effective in controlling mastitis.

Experiment in field control

To make an effective impact on mastitis there must be a two-pronged attack. Not only must the infection rate be reduced but existing infections must be eliminated. In the past four years an experiment in the field-control of mastitis has been carried out jointly by the N.I.R.D. and the C.V.L. to discover how effective it might be.

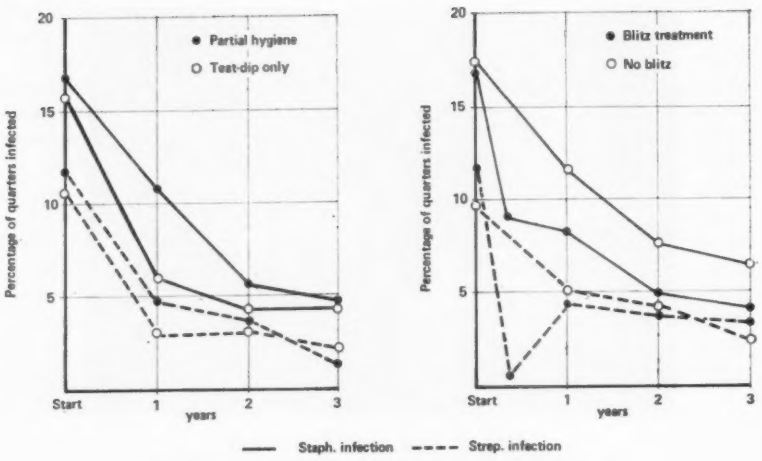
Strip cup being used before washing

Thirty herds took part in the experiment, which consisted basically of applying a simple hygiene routine to the cows at each milking and treating every cow at drying-off with benzathine cloxacillin*. In addition, all sub-acute cases of clinical mastitis were treated with a standard preparation while the acute cases were treated by the local veterinarian as he thought fit. Milk samples were collected when necessary to monitor the scheme but at no time was the farmer told of the actual infection present in the cows. He carried out the routine 'blind' and thus the method could be used by any farmer without the need of laboratory support.

Two hygiene routines were compared. In half of the herds the milkers wore rubber gloves and the udders were washed with a hypochlorite solution (600 ppm of available chlorine) using paper towels. The hands were dipped in the bucket of hypochlorite before handling the milking-machine or an udder and the fore-milk was examined before each cow was washed. There was no cluster disinfection but the teats were dipped in a hypochlorite solution (40,000 ppm) immediately after the cluster was removed. This teat-dip was a special formulation with a low causticity. In the other half of the herds teat-dipping only was carried out as a means of controlling new infections. Milkers were free to use their hands bare, water without disinfectant and communal cloths to wash the udders. The fore-milk was usually examined after the cows were washed but it had to be used at every milking.

At the start of the experiment eight of the herds on each hygiene routine were intensively treated in every infected quarter with three doses of sodium cloxacillin at daily intervals. This was done to find out whether it would be of benefit to reduce immediately the infection levels in these herds.

*Orbenin Dry Cow.



Graphs showing results of hygiene and treatment routines

Results of experiment

The following table gives the results for all herds of the infections found at the start of the experiment and at each annual herd test. These clearly show a reduction in the infection level each year, most markedly in the first year; starting with 55 per cent of infected cows and 27 per cent of the quarters there was an overall reduction to 19 per cent and 7 per cent respectively by the end of the three years.

Cows and quarters infected at the start of the experiment and at the annual herd tests

Time	*No. of herds*	*No. of cows in milk*	*Percentage of cows infected*				*Percentage of quarters infected*			
			Staph.	*Strep.*	*Other*	*Any*	*Staph.*	*Strep.*	*Other*	*Any*
Start	30	1,422	38·3	25·5	1·8	55·2	16·6	11·1	0·7	27·4
1 year	30	1,562	20·4	11·7	2·0	28·9	7·9	4·2	0·6	12·2
2 years	30	1,613	13·7	11·0	1·7	22·1	5·1	3·7	0·5	8·8
3 years	30	1,770	11·1	8·4	3·2	19·2	4·1	2·6	1·1	7·3

In the two graphs the results obtained with each hygiene group and with the 'blitz' and 'no blitz' groups are compared.

So far as hygiene is concerned, there was no difference between the two groups although it was found that more new infections occurred when teat-dipping only was used. However, the combined effect of dry-period therapy and prompt treatment of all clinical cases cancelled out this difference.

The same picture is apparent when comparing the treatment groups. Any initial benefit that the very expensive 'blitz' treatment provided was almost entirely overtaken by the time the herds in the untreated group had gone through a dry-period. It would appear that this method of dealing with mastitis is justified only in the very exceptional circumstances when immediate remedies are necessary if a herd is to remain in milk production. It is

not recommended that herds with a sub-clinical mastitis problem should be treated during lactation.

These results, which were obtained from thirty herds, conceal a wide variation in the success of the control measures in the different herds. All showed an improvement but in some it was much better than in others. Four herds did not respond well; while this could be due in part to inadequate attention to the hygiene routine, that is not the complete explanation and the experiment has drawn attention to the need for further study both in improving the results of treatment and in the prevention of infection.

Conclusion

The experiment described represents a simple but reliable method of controlling sub-clinical mastitis. The basic essentials of this control are:

the prevention of udders becoming infected by dipping the teats in an approved teat-dip immediately after the milking-machine cluster has been removed;

the elimination of existing infection by the routine treatment of *every* cow at drying-off, and the prompt treatment of all clinical cases as advised by your veterinary surgeon.

The use of rubber gloves, paper towels and a disinfectant in the washing water are additional safeguards but the extra protection which they afford appears to be of little importance.

The cost of this control will depend upon the teat-dip and the antibiotics used at drying-off. If a hypochlorite* teat-dip is used, it should not be more than £1 per cow per year, even with the more expensive dry-cow treatments.

Dipping teats in antiseptic solution after milking

It is known that the cost of mastitis in the average herd is £12 per cow per year and in the 30 herd experiment there was a 75 per cent reduction in the level of sub-clinical mastitis and at least a 60 per cent reduction in the incidence of clinical cases.

Finally, two words of warning:

(*a*) The greatest care should be taken when using intramammary antibiotics and this is particularly important at drying-off. Infections can be inserted along with the antibiotics if the teat-ends are dirty and an incurable mastitis can result. Before inserting the nozzle of a tube through the teat-orifice, clean the ends of the teats with cotton-wool soaked in methylated spirit. Make sure that the nozzle does not become contaminated before insertion.

(*b*) Mastitis control is for ever! The organisms which can cause mastitis cannot be eradicated entirely and the hygiene routine of teat-dipping must be applied to every cow twice a day and every day. This is the simplest mastitis control system that has been shown to be effective but it must become part of the milking routine so that it is done automatically and is never missed.

*The 4 per cent sodium hypochlorite teat-dip used in this experiment is not available commercially but a cheap and effective alternative can be made by mixing one part of an approved dairy hypochlorite with nine parts of water. Iodophor teat-dips are also effective at a strength of 5,000 ppm of available iodine and it may be advisable to change from a hypochlorite teat-dip to an iodophor teat-dip containing 33 per cent glycerine should the teats be badly chapped.

The author, **C. D. Wilson, M.R.C.V.S.**, is a Senior Veterinary Research Officer stationed at the Ministry's Central Veterinary Laboratory, Weybridge. Mr. Wilson has made a special study of the problems associated with mastitis.

Animal Health—Return of Proceedings for 1970

The Return of Proceedings, under the Diseases of Animals Act 1950, for the year 1970 has been published by the Ministry of Agriculture, Fisheries and Food and the Department of Agriculture and Fisheries for Scotland.

It contains brief reports and statistical information relating to diseases of animals in Britain.

Copies of the Return of Proceedings may be obtained from H.M. Stationery Office, or through booksellers, price 10p (by post 12½p). A comprehensive report for 1970, which will include details of the work of the Laboratory Research and Investigation Services, will be published later.

In this article the author discusses how, by using improved cooling techniques, problems of deterioration in harvested strawberries can be reduced.

Handling and Marketing Strawberries

M. G. Banwell

CHANGES in the attitude of customers towards the packaging and presentation of horticultural crops are clearly affecting traditional methods of strawberry marketing. With retail outlets seeking increased supplies of fresh produce for their 'cooled counters', radical changes will have to be considered by the growing industry to meet the challenge.

The problem facing the grower is that the strawberry is harvested at a high ambient temperature when very mature and likely to spoil quickly if nothing is done to stop deterioration. Work in Britain and the United States has shown that it is possible to maintain the appearance and increase the shelf life of the fruit by pre-conditioning, cooling the fruit rapidly and using refrigerated transport.

Field shelter

To be able to provide fruit of the desired quality, certain basic requirements have to be met, starting with the preparation of the site. It is only recently that the benefits of shelter to protect strawberry and raspberry crops have been demonstrated experimentally in Britain, although there is evidence from experimental work undertaken in Holland, and many growers have noted differences in cropping near to and away from shelter. Living material for shelter purposes is described in Short Term Leaflet No. 104—Windbreaks for Orchards, and various plastic nettings have been produced commercially and are being used as temporary shelter screens. The amount of shelter required in the field will depend on the site and its exposure risks.

Use of irrigation

In recent years irrigation has proved very useful, particularly at and near fruiting time. When applied before and during harvest, fruit size is maintained

and a bright berry produced; this would have been risky before the introduction of the fungicides available today to combat botrytis, e.g., dichlofluanid and benomyl. Irrigation is often essential for establishing runners in late July and through August, depending upon whether cold stored or fresh dug runners are used; once the runners are established, it can be used to build up crown size and potential flower numbers on the trusses for the following year. In the case of both cold stored and fresh dug runners the health standard should achieve at least the Ministry of Agriculture A Certificate, as yield will be even more important in a more tightly controlled system of marketing.

Picking and handling

If the marketing is to be to points of direct sale, particularly if it is to satisfy any development in cooled counter trade, the picking and handling of the strawberry crop will have to be very well controlled. Fruit must be picked when light red rather than later when fully ripe, and it must be firm and evenly graded. This in itself calls for a tight control on picking standards. In addition, however, an assessment will be needed before picking starts of the likely yield and tonnage to be handled each day, because to maintain the standards mentioned picking must be kept tight. Taking as an example a picking rate of 75 hours per ton, it would take 375 hours for one person to pick a 5-ton crop area; even with the generally recommended ten pickers per acre, some seven days would be needed to clear the area. Season can also affect the time taken to pick a crop; 1969 was a cool, good season for picking, drawn out and no real gluts; 1970 was a dry and very warm season with the fruit ripening very rapidly. It is therefore very important to calculate how many pickers will be needed and are available, and, if necessary, to either regulate the crop area accordingly or allow a margin of pickers to deal with any problems that may arise.

There is no need to describe here the routine of picking; this is well covered by Short Term Leaflet No. 81—Harvesting Strawberries. However, it is important for attention to be paid to the field layout and reception area so as to reduce carrying distance and to enable quality inspection or other handling operations, e.g., palletization, to be carried out at one point. Picked fruit should be moved to the shade as quickly as possible, or better still to a cold store or other means of cooling.

Cold storage

Work undertaken at the University of California into the time taken between the picking and cooling of fruit has demonstrated the advantages of rapid removal to a cooling process which will immediately remove field heat. If the recent improvements in strawberry handling are developed, the fruit will be placed into cold storage at around 2°C and then cooled to a flesh temperature of about 4°C before being loaded into refrigerated transport operating at 1–2°C. Cooling in this way will mean that fruit picked at 18–21°C will be sold some 24–36 hours later.

Air cooling

Cold storage, however, is not generally available on strawberry holdings, but early work at Ditton Laboratory has shown the value of air cooling, a technique which has been fully developed in California and is now practised there commercially. In this process the fruit is placed into forced air cooling units as soon as possible after picking; the units remove the field heat and reduce the temperature to around 1–2°C within 1–1½ hours, after which the fruit is transferred to refrigerated transport maintaining a temperature of 2°C by means of an auxiliary engine or power supply. A project is being developed by A.D.A.S. in the South East to produce, in 1971, a prototype field cooler for use with strawberries. This kind of cooler could also be used for other crops such as raspberries, cherries and lettuce.

This method of cooling is likely to attract growers who have a sufficient acreage to give a regular daily supply of fruit, collective groups of growers or even co-operative organizations. Distribution of the fruit will obviously be a combined exercise involving good communications, careful treatment, and efficient transport and handling facilities.

Containers

Once picked and inspected, the fruit has to be moved for cooling; for this palletization will be almost essential, especially if the cooling operation takes place in the field and the fruit is to go into refrigerated transport. For this purpose an ample supply of containers will be required. It is important to remember that after cooling the fruit will very rapidly absorb heat again, probably 4–5 times quicker than it took to lose it. Standardization of containers is therefore essential to speed handling and minimize heat reabsorption.

Work in the United States has led to the design of a standard fruit tray containing 12 one-pint punnets (355 grammes or approximately 12½ oz). The design of the tray allows the air flow of the cooling process to pass over and around the fruit; some developments of it are currently being studied in the South East. Uniform package sizes are not at present in general use, but metrication could introduce them. The sizes to be adopted, however, are still to be decided. As the fruit will be sold mainly in large stores along with other goods and produce, there has been discussion on how spillage and pilfering can be prevented; this is a difficult problem because any extra operation after picking involves further costs to the grower and an additional process prior to cooling. Alternatively, fruit could be wrapped after cooling but prior to loading, but in so doing it would rapidly warm up and deteriorate. One way to solve the problem would be to re-design the existing punnets to include a plastic lid, or netting, that could be easily fixed after quality inspection in the field.

Grading the crop

Although a brief mention has been made of maintaining a standard product, nothing has been said about grading which can only be done before picking and must be considered in relation to the variety being marketed. No common standards are laid down in this country; in the European Economic

Community varieties are classified as large and small and, for export purposes, two grades are used with two sizes for both large and small varieties. The sizes range from 30 mm minimum diameter for the large extra class to 15 mm minimum for the small Class 1 fruit. There are also variations of size in the early part of the season for large varieties when the fruit size minimum is reduced from 25 mm to 18 mm for Class 1.

The aim of the strawberry grower himself is to be able to produce a bold, bright, disease-free berry of a size to satisfy the majority of buyers—the very large perhaps satisfying a specialist demand—and with no appreciable quantity of small fruit which may be more difficult to market.

The author, **M. G. Banwell, N.D.H.**, is Assistant Regional Fruit Adviser with A.D.A.S. at the East Malling Research Station, Kent.

Single copies of the Short Term Leaflets mentioned in this article can be obtained, free, from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex HA5 2DT.

Ministry Publications

Since the list published in the April 1971 issue of *Agriculture* (p. 177) the following publications have been issued.

MAJOR PUBLICATIONS

BULLETIN

No. 50 Commercial Rabbit Production (Revised) 45p. (by post 47½p)
(SBN 11 240350 6)

FIXED EQUIPMENT LEAFLET

No. 42 Round Timber from the Farm (Revised) 22½p. (by post 25p)
(SBN 11 240582 7)

OUT OF SERIES

Horticulture in Britain Part II Fruit and Flowers (New) £4. (by post £4·10½)
(SBN 11 240957 1)
Agricultural Statistics 1968–69 England and Wales (New) £1·25
(SBN 11 240953 9) (by post £1·31½)
Agricultural Statistics 1967–68 United Kingdom (New) 65p.
(SBN 11 240998 9) (by post 69½p)
Fatstock Guarantee Scheme 1971–72 (New) 30p. (by post 32½p)
(SBN 11 240981 4)

FREE ISSUE

ADVISORY LEAFLETS

No. 115 Slugs and Snails (Revised)
No. 284 Potato Cyst Eelworm (Revised)

SHORT TERM LEAFLETS

No. 13 Feeding the In-Lamb Ewe (Revised)
No. 37 Rhubarb Sheds (Revised)
No. 52 Suggestions for Chemical Weed Control in Vegetables (Revised)
No. 76 Oil Seed Rape (Revised)
No. 85 Production of Apples on Spindle-bushes (Revised)
No. 119 Brussels Sprouts—Harvest Systems and Packhouse Layout (New)
No. 121 Sow Breeding Calendars and Records (New)

UNNUMBERED LEAFLET

Electricity on the Farm (Revised)

Priced publications are obtainable from Government Bookshops (Addresses on p. 229) or through any bookseller. Single copies of the free items are obtainable from the Ministry of Agriculture, Fisheries and Food, (Publications), Tolcarne Drive, Pinner, Middlesex, HA5 2DT.

Stonehenge

46. Wiltshire

D. E. Y. Morris

EVIDENCE abounds in Wiltshire of man's activity in the past. Dry, hilly land attracted him, and in these respects there was much to offer. He left many monuments, probably the strangest being Stonehenge. This bleak monument of immense stones rests on the south side of Salisbury Plain. Evidence suggests that about three-and-a-half thousand years ago some of these huge blocks were brought from Pembrokeshire. They stand in huge circles at the centre of which sacrificial rites may have been performed by our ancestors.

In the neighbourhood of Stonehenge are no less than 345 barrows, or burial mounds. Some of these—the long barrows—are more significant because of their long shape and size; no doubt they are the resting places of the important personages. In the north of the county is Avebury; there two vast circles of sinister stones surround the village, which lies on the site of what must have been some ancient shrine. Nearby lies Silbury Hill—the largest ancient man-made mound in Europe—still an enigma despite many attempts, some televised, to discover its origin and purpose. Elsewhere field systems, remains of ancient villages and earthwork castles are evident.

Soils

The saying 'as different as chalk is from cheese' originated in Wiltshire. This phrase literally describes the difference between two of the major soil types in the county. These are the chalk soils, which run in a wide north-east to south-west belt in the south and the heavy clay soils in the north. Adjoining Gloucestershire, the Cotswold and the Thames Valley gravel soils border on to the intractable Oxford Clay. Greensands fill the gap between this clay and chalk, probably the most famous area being the Vale of Pewsey. In the south-west corner, on the Dorset and Somerset borders, are Kimmeridge clays which are as difficult to work as those in the north of the county.

Luckily, Wiltshire is virtually unspoilt by the urban monster we so often see on our doorstep. It is a county of wide open spaces in which, with the exception of Swindon, a traditional centre of heavy industry, there are only a handful of small centres of commerce. Small towns like Devizes, Calne and Malmesbury are still rural in their nature and it is to be hoped they may long remain so.

Salisbury Plain

Salisbury Plain, a bleak and barren tract occupied by the Ministry of Defence, virtually splits the county in two; it divides the county in a psychological way, too, for people do not willingly travel over it. The Plain and the chalk thereunder act like a giant sponge to give rise to the famous chalk streams of South Wiltshire, an area typified by the chalk downlands and river valleys which converge on the county town, Salisbury, whose magnificent cathedral spire reigns over the surrounding countryside. In these valleys are the water meadows, large areas of once flood-irrigated pastures which supported large numbers of sheep, but which today are somewhat derelict due to changes in the economics of farming.

Farming

Soil types determine farming systems and in this Wiltshire is no exception. Dairy farming predominates on the heavy soils and there is little alternative. The Chalk and Greensand offer more scope and on these a ley and cereals system is usually practised. These are generally larger farms; about half of them carry a dairy herd which by most standards is large and the others operate with other stock using the grass. About two-thirds of the arable part of the typical farm is under cereals, both wheat and barley; oats are not a popular crop because, on the chalky soils in particular, there is a fair share of cereal cyst eelworm, an indigenous pest favouring a high pH. There are no other crops of any significance although probably every arable crop is represented by a token acreage on the holdings of the more enterprising farmers.

To most people the mention of Wiltshire usually conjures up a mental picture of large cereal farms growing endless acres of barley. However, the largest part of farming income is derived from dairying; the annual milk cheque is worth around £13 million, exceeding the county's gross cereal income by about £4 million. The dairy herd stands at just over 97,000 cows, a number which has been attained again following a fall in size after 1963. The cows are spread over 1,800 herds and produce about 81·5 million gallons of milk annually. Cow performance has improved considerably of

late, being now in the order of 840 gallons of milk sold per cow per annum. In spite of modern dairy systems, 37 per cent of the herds are milked in cowsheds and almost half are loose housed, that is in straw yards, cubicles or kennels, while about 15 per cent are outwintered. These tend to be on the freer draining soils.

Of the total acreage of about a quarter of a million acres of cereals, 30 per cent are under wheat, a proportion which is steadily rising at the expense of barley. Wheat is not a traditional crop and has been grown successfully only on the lighter lands with the introduction of modern varieties. The remaining cereal acreage consists mainly of barley, only some 10,000 acres of oats being grown.

Labour

The labour force continues to dwindle at the rate of just over one man every day. On many farms the number of staff is so low that there may even be instances where an extra man could be justified solely in order to obtain better yields through more timely operations.

Wiltshire, the county town of which was once Wilton, the ancient capital of Wessex and now famous for its carpets, is a county of good farmers, deep traditions and ancient history. It can be justly proud of its heritage.

★ ★ ★

Nematodirus in Lambs

Forecast for the late spring and early summer 1971

Nematodiriasis is a disease of lambs caused by a parasitic worm. Infected lambs pass worm eggs on to pastures during late spring and summer. These eggs usually hatch some time during late winter and spring of the following year, thereby infecting the next crop of lambs.

A comparison between the 'onset of spring' and the incidence of nematodiriasis in past years shows that the incidence is high when springs are late and vice-versa. In late springs hatching of eggs coincides with the period when lambs are eating herbage. In early springs hatching of eggs occurs before lambs are eating herbage and a low incidence of disease ensues.

Incidence is also influenced by rainfall. Prolonged dry weather occurring when eggs are due to hatch in April delays infection of herbage until May, thereby increasing incidence above that expected from the analysis of temperatures. Conversely, dry weather in May when eggs are due to hatch in May delays infection of herbage to such an extent that lambs are too old to suffer greatly from the disease. In such years the incidence of nematodiriasis is much less than expected. It was for this reason that little disease was encountered over most of England and Wales last year in spite of a very late spring.

Nematodiriasis in lambs is expected to be marginally above the average level this year unless control measures are undertaken to prevent losses.

Control of the disease may be obtained by grazing this year's lambs on pastures not grazed by last year's lamb crop. On many farms this practice is not possible and control must be obtained by treating the lambs with one of the anthelmintics known to be effective against nematodirus. Full instructions on their use are given with each preparation. Further information on this disease is given in the Ministry's Advisory Leaflet No. 491 Nematodirus Disease in Lambs.*

*Single copies of the leaflet are available, free of charge, from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex, HA5 2DT.

Cubicle Yards for Controlled Easy Feeding

H. Harland, *A.D.A.S., London*

Ad lib. self feed silage or a controlled easy feed system—that is the choice which many dairy farmers have to make when planning a new cubicle yard. There are, of course, many factors which can influence the choice in different farming situations, but the concensus of opinion over the last few years seems to be swinging away from *ad lib.* self feed silage in favour of systems which enable better feed control to be exercised. In this article a typical cubicle yard with controlled easy feed facilities is described and some of the reasons underlying the choice of layout and the feeding system are examined.

Typical layout

The layout illustrated is designed to house 112 cows in double rows of cubicles on each side of a central feed area. Access to the feed area is at each end of the inner row of cubicles. In smaller units a single access may be provided in the centre. The feed barrier may be constructed of stub R.S.J.s with a dwarf wall of two railway sleepers on end and a single tubular rail at the top. This type of barrier is cheap and functions very satisfactorily. More sophisticated barriers with or without yokes for individual feeding can be used, but in practice their extra cost is sometimes difficult to justify.

Feed is brought to the barrier by way of the central feed passage which must be wide enough to take a trailer or forage box and provide some space for weekend storage of feed. While the feed is being brought in the cows are held in the cubicle areas by means of gates placed across the access passages.

Building costs

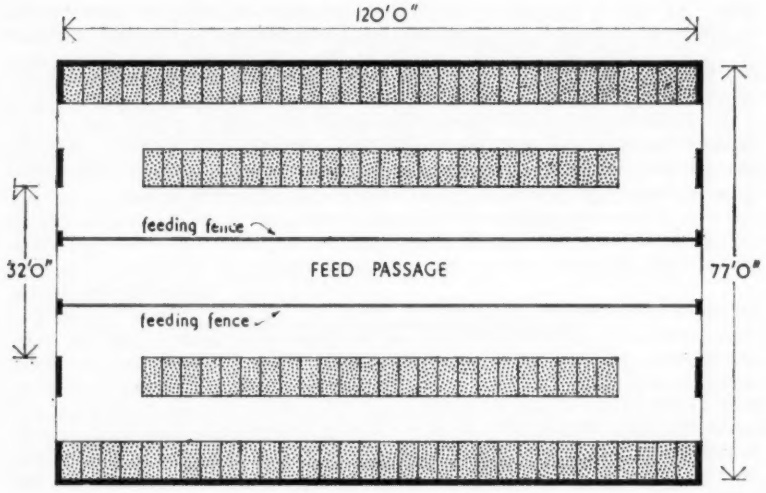
Generally the cost of a yard of this type is about the same as a layout for a similar number of cows based on self feed silage and cubicles. There can, however, be some cost saving when existing buildings can be used for the storage of hay or silage. Because of size, type or siting the same buildings might not be suitable for a self feed layout.

Arguments for easy feeding

Higher feed costs, especially during the past winter, have emphasized the importance of efficient feed utilization in profitable livestock farming. Self feed silage can be wasteful whereas controlled feeding is generally a more efficient system allowing greater flexibility in feed policy.

Silage frequently provides an excess of protein which can be balanced by cereals for milk production. With a feed barrier it is more convenient to feed silage and cereals at the same time. The feed barrier system is suitable for feeding not only silage and hay but also brewers' grains, potatoes and other foods and a farmer is thus able to take advantage of cheap feed when it is available. A layout designed specifically for self feed silage does not allow the same flexibility, unless an additional feed area for supplementary feeding is provided.

Where the stocking rate is high it is sometimes difficult on an *ad lib.* self feed system to provide a balance of silage to cater for a late spring when there may be very little grass about. If silage runs out then a fairly high cost feed system must be adopted for a short period. With easy feed facilities and controlled feeding, silage can be rationed out and a reserve of hay or other food maintained which can be carried forward to the next year if not required.



Layout designed to house 112 cows

Under a controlled feeding system, higher stocking rates are possible and there is usually more scope for herd expansion. This is of special significance to the smaller farmer who, with this type of layout, can use more acres for grazing and buy in additional winter food. For some individuals this may be a better proposition than buying extra acres to achieve herd expansion.

The layout is also suitable for zero grazing, either throughout the summer or for limited periods in the spring or late autumn when severe poaching of land from grazing can result.

If required, the layout can readily be divided by means of gates across the cubicle gangways and feed areas to provide accommodation for up to four different batches of cattle, e.g., dry cows, highest and lowest yielders and heifers. Wherever this division is made, the feed barrier space is always in the right proportion to the number of cubicles and the batches of cattle can thus be fed independently.

Very high yielding cows can be a problem in herringbone milking parlours by slowing down the milking routine. With the feed barrier arrangement the the highest yielders can be given part of their production ration in the cubicle yard.

Arguments against easy feeding

The main disadvantage of the easy feed layout is the handling of food between store and feed barrier. Of course, handling can be simplified by mechanization but the cost of fully mechanized systems is difficult to justify except in the case of large scale enterprises. In practice many farmers operating the barrier system adopt some form of limited mechanization. For example, where silage is fed, it can be loaded on to a trailer by a mechanical grab and then thrown off by hand as the trailer is driven down the feed gangway. Where hay is fed, the bales can be transported to the barrier on a trailer, a fore-end loader or a buck rate.

Judging by the experience of farmers who feed their stock in one of these ways, the task is not nearly so onerous or time-consuming as some people imagine. If a labour comparison is being made with the *ad lib.* self feed system, then one should not overlook the time involved in moving the feed fence and cleaning up the waste at the silage face.

To quantify the arguments for and against this type of cubicle layout and feeding system is not possible in this short article. It is, however, obvious that the choice of feeding system and the building layout to suit that system deserves thorough investigation before any capital is committed.

Horticulture in Britain—Fruit and Flowers

The second part of *Horticulture in Britain*, which deals with fruit and flowers, has now been published. Part 1 was published in 1967 and dealt with vegetables and glasshouse crops; the two volumes bring together for the first time a wealth of statistical information about production, imports, consumption, price trends, etc., covering a period of more than twenty years.

The arrangement of the statistics in the new volume is similar to that used in Part 1, and demonstrates the way in which horticulture has adapted to technical developments, trends in consumption and the growing needs of the manufacturing industries.

Both volumes are mainly the work of Mr. P. G. Ellis, who is a member of the Department of Horticultural Marketing at Wye College (University of London).

Copies of *Horticulture in Britain: Part 2: Fruit and Flowers*, price £4 (by post £4·10½) and *Horticulture in Britain: Part 1: Vegetables*, price £2·88 (by post £3) may be obtained from H.M. Stationery Office, or through booksellers.

in brief

- **Large unit dairy herds**
- **Cheeses: round or rectangular?**
- **British Association meeting**

Large unit dairy herds

THE economics and social circumstances of our times lead remorselessly to bigger units, whether we are considering the amalgamation of industrial businesses, the establishment of consortiums, new patterns in agricultural production or the concentration of retail selling. Economies of scale have been shown to be more than a slogan and no less appropriate on the farm than elsewhere. In this vein much has been written and said about the future development of our dairy industry and its ultimate structure if its viability is to be equated with its service to an increasing population. The solid base of this structure continues to be the size, make-up and management of its component herds, and if over the past forty years the average size of dairy herds has grown with the facilities of mechanization, we nevertheless still have a structure which is essentually of a multiple business character. The idea of the formation of new herds as large single units has not so far attracted any appreciable following.

A survey* conducted by the University of Nottingham's Department of Economics has been directed to the study of this question, looking at the largest dairy herds in England and Wales in relation to their growth, structure, management, husbandry and location in an attempt to assess the potential of such a change. Traditionally, the individual dairy farm is integrated simply to carry a certain head of stock plus herd replacements in relation to its food supply, milking facilities and overall management, whilst the supply of concentrates and the processing and distribution of milk are normally off-the-farm functions. With any appreciable spread of large milk production units, however, two structural changes are visualized by the University's report. First, each of the present farm operations would tend to be managed separately, serving the herd which would be milked, fed and housed at a single location; it would also be necessary to have a unit specifically for the rearing of herd replacements. Bulky fodders and other farming activities not directly concerned with milk production could be provided by farms similar to those already in existence. The second structural change could bring milk processing to the same location as the production unit, so instigating changes in the business structure, with the formation of financial firms associated with farming, dairy distribution and the feedingstuffs industry. Where such large units would be located would, of course, depend upon the economics of production and transport costs *vis-à-vis* retail distribution centres. Thus those units supplying the liquid market might be close to the main centres of population, provided the transport costs were low enough to more than offset the higher production costs. The processing units could more advantageously be sited in areas of low cost milk production.

'We should,' concludes the report, 'be concerned about the possible effect upon the dairy industry as a whole, both production and processing, if there were a

*_The Large Dairy Herd, Evolution and Prospects_. R. Owen Wood. Obtainable from the University, price 50p.

major change, a new model . . . Economic and social pressures are arising to bring much nearer development envisaged in this study. Farmers and their employees are changing their ways of living and they are less willing to put in the long hours of manual work each day, characteristic of farmers of recent generations. At the same time there are increasing political and economic pressures to control costs of production and to change marketing methods. These various pressures may trigger off the development of very large unit herds in the United Kingdom. Once this has happened, there could be a rapid increase in their numbers and an associated adjustment to the structure of British agriculture.'

Cheeses: round or rectangular?

UNLIKE our Continental neighbours, we have never as a nation been great cheese-eaters. But the tide seems to be turning. The upward trend in the consumption of natural (as opposed to processed) cheese noted in the late 'sixties is shown by the latest figures to be close to 3·4 oz per person a week. Unquestionably, much of this stimulated interest must stem from the convenient purchase of the film-wrapped, air-tight consumer portions on display in every supermarket and chain store. As with so many other foods in the strategy of retail selling these days, presentation and convenience are governing methods of production, and where at one time all cheeses were made in the round, an increasing proportion today is coming out of rectangular moulds. The average housewife, being more concerned with getting value for her money than with traditional shape, has been quick to see the advantages of a rindless cheese hygienically packed and uniform in its quality; and the gain to the shopkeeper is no less obvious, since handling and serving become a great deal easier and the worry of seeing cut cheeses drying out and deteriorating in appearance and flavour the longer they remain on his counter is something he need not continue to live with.

A territorial variety of British farmhouse cheeses, now enjoying a better share of the home market since the recent voluntary trade agreement, is reasserting its place on the table as of right. Centuries of cheese-making, from the primitive practice of nomadic tribes, through the toil of farmers' wives and daughters at the cheese tub, to its modern, mechanized, high-quality production, have stamped tradition on our cheeses; but as valuable as that is, tradition is more justly seen as the stepping-stone to the future. The giant round Cheddars that were commonly made in Queen Victoria's time, needing twelve months to mature and two men to lift, have long since passed out of commerce. Those still being made are of a more manageable size and continue to delight the eye and the palate of the connoisseur, but the question inevitably arises whether consumer choice will not ultimately consign all round cheeses to the history books.

British Association meeting

RELEASE of the preliminary programme of this year's Annual Meeting of the British Association to be held in Swansea from 1st—8th September, shows the usual wide sweep of scientific interest. Focus in the agricultural section will not unnaturally be set on the relationship of grassland and livestock in Wales, with the sectional presidential address given by Dr. G. D. H. Bell. The Association's President, Sir Alexander Cairncross, has chosen the title of 'Government and Innovation' for his opening address, which will pose the question what can a Government usefully do to harness the application of scientific knowledge to economic and social advancement? Application for attendance and residential accommodation should be made quickly to the Secretary of the British Association for the Advancement of Science, 3 Sanctuary Buildings, 20 Great Smith Street, London, S.W.1.

AGRIC.

Books

Soils of Lancashire. B. R. HALL and C. J. FOLLAND. 1970.

Bulletin No. 5 of the Soil Survey of England and Wales gives a comprehensive report on the soils, landscape and land use within the county of Lancashire. The survey was carried out between 1959 and 1965. Much of the data relating to land use, however, is more recent and gives valuable information on rural Lancashire at the present time.

The early part of the report is devoted to the formation and classification of the Lancastrian soils.

The bulletin then covers the county area by area, from the Rankers at the top of Coniston Old Man in the far north to the raised peat moss at Chat Moss in the south. Each area has a chapter devoted to it which follows a similar pattern. The soil associations are discussed, giving their occurence in the county, their soil types, and geological and topographical features. The characteristics of the dominant soil groups are given and are illustrated by representative profile descriptions. Each section ends with a report on the main agricultural enterprises, levels of fertility and factors affecting soil husbandry. The text is well supported by tables, figures and maps, and the many photographs of landscapes illustrating the associations can only be described as outstanding. A good index makes reference easy.

Survey reports on the Preston District and the South West Lancashire Plain have been published previously by Harpenden, but this is the first comprehensive report covering the whole county. As such, it should become a standard reference book on the subject, of wide application, and of interest not only to agriculturists but also to planners on land use aspects, naturalists and conservationists for identifying habitats of flora, and students studying natural sciences within the county.

Copies are obtainable from the Soil Survey, Rothamsted Experimental Station, Harpenden, Herts. £2.

R.G.H.

The Reclamation of Exmoor Forest. C. S. ORWIN and R. J. SELLICK. David and Charles, 1970. £3·15.

The reclamation of Exmoor is one of the most spectacular achievements in the long story of the winning of the waste. It took the Knights, working in the full flush of Victorian vigour, and backed by the technical resources of the most advanced economy of their time, fifty years to establish a productive agricultural community in this upland wilderness. The theme attracted a worthy historian, for C. S. Orwin was among the wisest, shrewdest and most scholarly of all those who have served agriculture this century. This new edition of his history of the reclamation work makes this agricultural classic, first published in 1929, once more generally available.

The basis of the book is, of course, Orwin's text but R. J. Sellick has added two substantial chapters which bring the story up to date. Agriculturally, Sir Robert Waley-Cohen has continued the tradition of the Knights. More generally, the modern age has brought both benefits and problems. On the one hand, for instance, electricity has decreased the domestic burdens and isolation of this remote community. On the other, the tourist and conservationist now make forceful demands on the area, which in 1954 was declared a National Park. Here as elsewhere, the pressures on land are too great to allow agriculture the automatic priority it once received. Mr. Sellick comments drily that the reclamation could never have taken place if the Countryside Act had been in force at that time and adds the warning that 'without a healthy agriculture, Exmoor could become a near derelict land, with few people save the summer visitor'.

The new edition includes a memoir of Orwin, William Hannam's account of his experiences as an Exmoor farmer in mid-Victorian times, and a bibliography—incidentally, should this not contain a reference to Baker's 1949 survey? The fifty photographs will delight farmers, tourists, conservationists and historians alike.

N.H.

The Role of Agriculture in Economic Development. National Bureau of Economic Research, New York. Edited by ERIK THORBECKE. Columbia University Press, 1970. £5·65.

The Universities—National Bureau Committee for Economic Research is a co-operative venture of universities and the

National Bureau for Economic Research in the U.S.A. Its purpose is the encouragement of research into economic problems which are of broad scientific and public interest.

The proceedings of a Conference arranged by the Committee and held at Princeton in 1967 have been published in book form. The almost impossible task of covering all aspects of agriculture's role in economic development was abandoned in favour of three main themes selected for discussion: agriculture in the world economy, the relationship between agriculture and other sectors, and selected national studies analysing the transformation of traditional agriculture.

The papers given at the Conference and published in this volume mark an important stage in the evolution of the concept of the role of agriculture in economic development. In the 1940s and 1950s it was widely believed that industrialization was the key to economic development. Industry, as the developing sector, would be a source of alternative employment to the rural population, would provide a growing demand for food and for agricultural raw materials which would be processed into products for domestic consumption or export. It would also supply industrial inputs, such as fertilizers, to agriculture.

More recently it has become increasingly recognized that the inter-dependence of the agricultural and industrial sectors are essential for growth, and that the more advanced industrial sector cannot pull with it the backward agricultural sector. But even these dual-economy models ignored foreign trade and the determinants of agricultural output.

From the distinguished contributions to this Conference, a general consensus of opinion emerged. First, a meaningful analysis of agricultural development must bring out the relationships between the agricultural, industrial, services and foreign trade sectors. Second, there is no universally applicable agricultural development strategy and successful experiences have only a limited transferability. This book should be read by all economists with an interest in development policies. The sources of reference, alone, would qualify for a place on the professional's bookshelf.

R.C.R.

books received

Animal Traps and Trapping. James A. Bateman. David and Charles, 1971. £3·50.

Maize for Grain—A Grower's Handbook. G. M. Milbourn. Wye College Maize Unit, 1971. Copies obtainable from the Home-Grown Cereals Authority, Haymarket House, Oxendon Street, London, S.W.1. 40p.

The West of Scotland Agricultural College Report on the Work of the College for the Year ended 30th September, 1970. Copies from the West of Scotland Agricultural College, 6 Blythswood Square, Glasgow, C.2.

Structural Change in Northern Farming. T. P. Phillips and S. J. Rogers. Copies from the Agricultural Adjustment Unit, University of Newcastle upon Tyne, NE1 7RU. 1970. 50p (postage 5p extra).

Farming in the East Midlands—Financial Results 1969–70. Copies from the Department of Agriculture and Horticulture, University of Nottingham. 1971. 40p.

Thinning Control in British Woodlands (Metric). R. T. Bradley. Forestry Commission. H.M.S.O., 1971. 70p.

Operational Research and the Managerial Economics of Forestry. P. A. Wardle. Forestry Commission. H.M.S.O., 1971. £1·55.

Soil Groups of Upland Forests. D. G. Pyatt. Forestry Commission. H.M.S.O., 1970. 40p.

Hatching Gamebirds' Eggs. Copies from The Game Conservancy, Fordingbridge, Hampshire. 40p.

Condensation Problems in Farm Buildings. R. J. Forsyth and C. S. Shepherd. Copies from the West of Scotland Agricultural College, 6 Blythswood Square, Glasgow, C.2.

An Agricultural Land Budget for Britain 1965–2000. A. M. Edwards and G. P. Wibberley. Copies from the School of Rural Economics and Related Studies, Wye College, Ashford, Kent. 1971. 75p (post free).

Fruit. A Review of production and trade relating to fresh, canned, frozen and dried fruit, fruit juices and wine. Copies from the Commonwealth Secretariat, Printing Section, Marlborough House, Pall Mall, London, S.W.1. 1970. £2 (£2·15 by post).

Britain, New Zealand and the E.E.C. Copies from the New Zealand High Commission, New Zealand House, Haymarket, London, S.W.1.

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